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Budgeting to Avoid Investment Errors

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Introduction

Expanding an existing enterprise or starting a new one usually requires additional capital. That capital can be supplied from owner's equity, borrowed funds, or a combination of the two. Regardless of the source, an estimate of expected returns and costs is needed to evaluate the proposed change.

The budgeting process used to arrive at those estimates often presents some interesting questions. This publication identifies possible shortcomings in the budgeting process that should be recognized by the users of budgets and discusses repayment plans in the context of risk management.

Budget Preparation: Are All the Questions Answered?

What is the source of budget estimates? When preparing a budget for a proposed expansion of an ongoing enterprise or starting a new one, information is needed from which to estimate returns and costs. Ideally, a farmer's own set of farm records should be available to obtain information (Herbst). For a new enterprise, information probably will not be available from the manager's own experience. In most cases, the farm manager needs unbiased information from an outside source (e.g., USDA or an agricultural college) to estimate returns and costs. Such information serves not only as a guide for estimating returns and costs but also as a checklist to ensure that all returns and costs are included. Examples of budgeting publications include *Farm Planning and Financial Management* (ID-68) from Purdue University and the *Farm Management Manual* (AE-4473) from the University of Illinois. Experimental data can be used in budgets, but adjustment often is needed for farm conditions. In addition, caution should be exercised when data are available for only 1 or 2 years.

What is the marketing situation? Commodity and input price estimates are major determinants of returns and costs used in a budget. When considering a long-term investment, the prices expected over the long-run should be given major consideration. Optimistic price projections for the immediate future should play a limited role in the investment analysis compared to price projections over the expected life of the investment. Price estimates used in a published budget may also need to be adjusted to local situations. For example, grain prices can vary 25 cents per bushel depending upon proximity to water transportation. Some commodity prices move in a seasonal pattern so that production and storage plans may determine whether seasonal high prices can be expected. Input prices may vary from one location to another depending upon the efficiency of the supplier and the amount of local competition.

Local markets may not even be available for some products or inputs. Transportation costs would then become a major consideration. An example might be contract production of canning vegetables. The processor may already have enough producers for the plant capacity. Other products may be so new in an area that markets have not developed.

The point is, when using a published budget, know enough about the local market to make appropriate adjustments in the budgeted prices. Knowledge of the local market also allows you to adjust central market or state average figures to a local situation.

How is price risk handled in the investment analysis? Sometimes little thought is given to price risk. Often return/cost estimates are viewed as *facts* and not as uncertain projections over several years. These uncertainties are a form of risk and should be incorporated into the investment analysis.

A "conservative" budgeting approach can be used to estimate returns and costs. For example, the most likely price of hogs over the next 5 years may be projected at $50/cwt., but to be on the safe side, $45 is used in the budget. On the other hand, risk may be recognized in the cost of equity capital by using an opportunity cost of 20 percent instead of 12 percent or 9 percent.

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A practical technique that can be used, is to prepare a "most likely outcome" budget, and then determine the product price and/or major input cost at which all costs would barely be covered. This allows you to ask, for example, "Am I willing (able) to take the chance of only breaking even, should hog prices decline $5/cwt. from my budgeted expectations?" Or, "Can I afford to work for nothing the first year if hog prices are $7/cwt. under my budget estimates?"

Another possibility would be to adjust the "most likely" budget to reflect a set of return/cost estimates that are both more and less favorable (perhaps with equal probabilities) than the most likely budget. The question can then be asked, for example, "Am I willing (able) to take equal chances of a $10,000 loss versus a $15,000 gain?"

However included, thought and analysis should be given to including price risk in the budgeting process. Likewise, thought should be given to the startup costs involved with an expansion or with a new enterprise investment.

Have startup expenses been considered? The typical budget is done on a "going concern" basis. It tries to answer questions like, "If I had farrowing, nursery, and feeding facilities; breeding stock; an adequate inventory of feed, supplies, and hogs of various ages; skilled labor and know-how; and sufficient operating capital, what would be my costs and returns?" But from the time plans are first drawn for facilities and the time the first hog is marketed, a year may have passed. Costs incurred prior to the beginning of the production process should be added to going concern costs. These include interest, labor, management, utilities, transportation, etc.

Additional startup costs are related to the "shakedown" period for a new enterprise or facility. During this period, equipment failures are paid for in extra hours of labor and/or lower production. Problems with machinery and equipment are solved, errors in planning are corrected, work routines are established, etc. These costs can be substantial.

Finally, to ignore the startup period can lead to errors in the timing of debt repayment. Initial payments may need to be reduced or postponed. Far better to plan this in advance than to wonder what went wrong when poorly planned payments cannot be made!

Often a major startup cost is obtaining management ability and skills. Those costs can be substantial, which brings up another question.

Does the manager have the necessary management ability and skills? For a farmer who is expanding an existing enterprise, indications of his/her management ability and skills can be obtained by comparing previous results with a norm or standard. Farm record summaries may be available on a type of farm or an enterprise basis. An individual farmer can then "rate" himself or herself, in relation to the group average, on total performance, and on key factors such as pigs per litter, milk per cow, and production per acre. Weaknesses might be corrected or the budget revised to reflect performance under a lower level of management. If the farmer has little or no experience, management ability and skills can be acquired through experience and study but at a cost of lower production and/or higher production costs. Alternatively, production might be started on a small scale.

In some situations, so little is known about production, or the risk of not mastering the art is so great, the endeavor should be undertaken only by those who have sufficient financial strength to initially take substantial losses. Production of purebred breeding stock, especially cattle, is a classic example of an art that is difficult to master. Relatively few are financially successful.

Have realistic interest costs been included? Estimates of the annual interest cost on capital items are usually calculated by applying an interest rate to the average investment over time, which can be represented by:

$i = (I/2)\, r$, or $i = (r/2)\, I$

Where:
i = Interest cost per year,
I = Initial investment, and
r = Annual interest rate.

This formula provides an estimate of average, annual interest costs and is often used in the budgeting process. However, this method tends to underestimate interest costs. For example, assume a $100,000 fixed investment that would depreciate over 5 years, and an annual interest rate of 10 percent. Using the method described above, the interest cost per year would be $5,000.[1] But if a loan were set up to be repaid at the same rate as straight line capital depreciation, the average interest per year is $6,000. This loan repayment method is called the remaining balance method (Table 1). The total interest paid when using this method would be $30,000, whereas the amount estimated with the more commonly used average investment formula would be only $25,000. Thus the amount actually paid would be 20 percent more than the amount budgeted.

[1] The objective here is not to focus on financing an investment but to use loan repayment plans as a means of estimating both the cost of borrowed funds and the opportunity cost of equity capital.

Table 1. Principal and Interest Payments by Type of Repayment Method

Year	Remaining balance method			Level payment method		
	Annual payments		Remaining principal balance	Annual payments		Remaining principal balance
	Principal	Interest		Principal	Interest	
1	$20,000	$10,000	$80,000	$16,380	$10,000	$83,620
2	20,000	8,000	60,000	18,020	8,360	65,600
3	20,000	6,000	40,000	19,820	6,560	45,780
4	20,000	4,000	20,000	21,800	4,580	23,980
5	20,000	2,000	0	23,980	2,400	0
	100,000	30,000		100,000	31,900	

The same answer can be obtained by correctly averaging the amount invested, which with straight-line depreciation is the sum of the initial investment, plus the investment at the end of the last year (or salvage value), plus one year's depreciation, divided by two, with the result multiplied by the interest rate. The mathematical relationship would be:

$$A = \frac{I + S + D}{2} r$$

Where:
A = Average, annual interest,
I = Initial investment,
S = Salvage value,
D = One year's depreciation, and
r = Annual interest rate

With another commonly used repayment method, the level payment loan, total interest would be $31,900 (Table 1) or an average of $6,380 per year. This is 28 percent more than the $5,000 per year figure obtained by using the first method.

The formula used in the first method, i=(I/2)r, can result in a serious underestimation of the average interest cost: first, because it underestimates average investment (or rate) and second, because it ignores the effects of compound interest. The remaining balance method underestimates interest costs because it ignores the effects of compound interest. With the remaining balance loan, $1,900 less is paid than with the level payment loan. But this "saving" disappears if we consider the time value of the difference in annual payments of the two repayment plans.

The more accurate estimate of interest costs comes from assuming a 100 percent level payment loan amortized over the life of the asset. A standard amortization table can be used to estimate average, annual interest costs. For typical hand budgeting, this is probably sufficient for profitability analysis, but cash flow estimates may be quite different, depending upon the amount actually borrowed and the length and term of the loan.

Analyzing Debt Repayment —A Case Example

The annualized budget provides information to help make the decision as to whether the venture is profitable enough to undertake but cannot be used, without modification, for cash flow projections. At best, such a budget may be considered as a long-run, average cash flow, but this is of little use in view of the fact that cash flow problems usually occur during the initial years of the project life.

Presented below is an example of how a typical budget can be modified and other information added and to analyze debt repayment capacity. Table 2 is a condensed version of a hog enterprise (100 sows, high investment) budget.[2] Adjustments to this budget can be made to estimate cash available for debt service, risk bearing and other uses, as illustrated in Table 3. This table is a "going concern" estimate of cash availability to which adjustments can be made for the initial year, usually the year in which the greatest cash flow problems occur.

The beginning point in Table 3 is the residual return from the budget. This represents cash since none of the income is noncash. To this is added the noncash expense of depreciation. Interest is added, 12 percent of average investment, as calculated in the budget. Note that not all of the overhead expense relating to capital (Table 2) is used in estimating cash available to the enterprise because repairs, taxes, and insurance are cash costs.

The subtotal of $45,535 in Table 3 is the going concern cash available after paying $3 per bushel for corn and $16,000 for labor. The assumption is made in this case example that the operator would not need income from the hog enterprise for family living; therefore, $16,000 is added to the cash available for debt servicing. In some situations, only cash opera-

[2] *Farm Management and Financial Planning,* ID-68, Purdue University.

Table 2. Estimated Income and Costs, High Investment Farrow-to-Finish Hog Production, 100 sows[a,b]

A. Income	
Market hogs, 3,750 cwt. @ $51.00	$191,300
Breeding hogs, 210 cwt. @ $44.00	9,200
Total	$200,500
B. Direct costs	
Corn, 23,000 bu. @ $3.00	$ 69,000
Purchased feed, 296,000 lb. @ $0.16	47,400
Total feed	$116,400[c]
All other	17,000
Total direct cost	$133,400
C. Overhead expense[d]	
Buildings @ 16.5% on $80,000	$13,200
Equipment @ 20% on $103,000	20,600
Breeding stock @ 13.4% on $20,500	2,700
Production inventory @ 13.4% on $44,000	5,900
Unpaid operator labor	16,000
Total overhead cost	$58,400
D. Total, all expenses	$191,800
E. Residual returns	$8,700

[a] All estimates rounded to the nearest $100.
[b] The unit for calculations is a sow in a herd divided into three groups. There are seven farrowings per year—2 1/3 litters per sow per year; 7 1/2 pigs raised per litter.
[c] Feed conversion = 400 lb./cwt. gain.
[d] Assumes facilities at 1981 new cost.

Table 3. Going Concern Annual Cash Available

Residual return from budget	$ 8,700
Add	
Depreciation:	
Buildings @ 7% on $80,000	5,600
Equipment @ 12.15% on $103,000	12,515
Interest on capital investment:	
Buildings @ 1/2 of 12% on $80,000	4,800
Equipment @ 1/2 of 12% on $103,000	6,180
Production inventory @ 12% on $44,000	5,280
Breeding stock @ 12% on $20,500	2,460
Subtotal	$45,535
Operator labor not needed for living expenses	16,000
Home grown feed adjustment	0
Cash from other sources	0
Grand total	$61,535

ting expenses for corn production would be needed, thus the difference between the budgeted corn price and cash operating expenses would represent additional available cash. There might also be other income, farm or nonfarm, which could be added to cash available to finance the hog enterprise.

Next, the going concern cash available figure (the bottom line of Table 3) must be adjusted to conditions expected during the first full year of operation, beginning nearly a year after the first group of gilts is placed in the facility. If gilts are used, there likely will be a reduction in litter size, and fewer cull sows will be sold. Feeding efficiency likely will suffer, and there probably will be adjustments and possible replacement of various items of equipment. These expenditures are difficult to estimate. Monthly records on hog enterprises that have been in operation several years would be helpful. Key factors could be observed in the beginning year and later years to get an idea of the magnitude of first year increases in expenses and shortfalls in income. Without such information, an educated guess is better than ignoring the problem. Month-by-month projections might be helpful; however, in this example the assumption is made that a group

of gilts will be added to the facility about every 52 days in the year prior to the first full year of operation. Detailed analysis would show some reduction in feed efficiency, and some additional miscellaneous expenses would occur in the startup year, but it is assumed that annual deductions from the going concern cash available would occur evenly throughout the first full year of operation.

The following figures are not based on empirical evidence, and thus are for illustrative purposes only.

Going concern annual cash available (table 3)	$61,535
Deduct	
1/2 pig per sow reduction in marketings*	3,100
Reduction in sale of cull sows	5,000
5% increase in feed use	5,800
Miscellaneous startup expense	1,000
Cash available, first year	$46,635

*Each pig reduction in marketings is assumed to reduce cash available by $62.

Next, estimate the amount to be financed, examine available credit terms, and determine if the cash available is sufficient to service the debt plus a reserve for risk. During nearly all of the startup year, there will be no cash from marketings. Outlays for breeder and production inventories will occur more or less evenly through the year. Interest will accrue on investment in building, equipment, and inventory buildup. The timing of these expense items and how they are financed are important at the time of actually getting the project going but are not essential in estimating the degree to which the project can be expected to cash flow. Simply lumping together all the outlays which might occur prior to marketing the first group of hogs, together with the cash available as adjusted above, provides the information needed to analyze cash flow potential during the first full year of operation.

Startup year interest is estimated as follows:

Asset	Budget value	1 year's interest @ 12%	Total
Buildings	$ 80,000	$ 9,600	$ 89,600
Equipment	103,000	12,360	115,360
Breeder inv.*	20,500	1,230	21,730
Prod. inv.*	44,000	2,640	46,640
Total	$247,500	$25,830	$273,330

* These inventory items will increase from zero at the beginning of the year to the indicated values at year-end; thus interest is charged on average investment.

These adjustments result in a 10 percent increase in investment (from $247,500 to $273,330) and debt servicing needs. This, coupled with estimated first full year cash available 24 percent below an average year (from $61,535 to $46,635) illustrates the extreme importance of careful cash flow analysis for the initial year of marketings.

With $46,635 available for debt servicing and credit needs of $273,330, are loan terms available to service the debt and leave an acceptable reserve? Assume that bimonthly payments would be made, beginning when the first hogs are sold, about a year after startup. With this payment schedule, cash available every 2 months would be $7,772 (46,635 divided by 6). Based on a level-payment plan (assuming 12 percent interest), bimonthly payments would be as follows on a loan of $273,330:

5-year loan	$12,204
10-year loan	7,864
15-year loan	6,574

A 15-year loan with bimonthly payments could be serviced, but it is not likely that a lender would want to finance a combination of inventory, equipment, and buildings on a long-term basis. Even though inventories of breeding stock, feed, hogs to be marketed, etc. function as a continuous investment, lenders typically want to match the repayment schedule for a specific asset with the economic life of that asset. A combination of maturities might be more acceptable, with payments as follows:

Investment	Amount	Term years	Bimonthly payment
Production inv.	$ 46,640	3	$ 3,111
Breeder inv., eqpt.	137,090	5	6,121
Buildings	89,600	15	2,155
Total			$11,387

The above debt service needs exceed cash available. If the operator had equity financing for the $46,640 production inventory, the lender might agree to finance the remaining amount ($226,690) on a term of 10 years with payments of $6,522 per bimonthly payment or a total of $39,132 for the year. This leaves $7,503 per year as a cash reserve or margin.

This is only one of numerous financing alternatives. One interesting possibility, which would require less equity, would be to reduce principal payments on the intermediate and long term loans the first year or so. At the end of this period, operations would reach "normal" levels, with increased cash available to make full principal payments.

The cushion of $7,503 is 16 percent of estimated cash available. Is this sufficient for possible shortfalls in available cash or increases in cash expenses? The answer depends in part upon the (1) attitude of the operator with regard to risk, (2) the probability of adverse conditions which would wipe out

the cushion, and (3) the consequences of a failure to meet cash flow needs.

Individual reactions to the same risk situation differ widely. Some people enjoy risk; others try to avoid it. Any business venture carries some risk, but each person needs to choose a risk situation with which he/she feels reasonably comfortable and doesn't worry or become irritable or physically ill. What a neighbor does or what is recommended by "experts" may not be acceptable to a given person. Highly personal and subjective decisions are made regarding risk-bearing.

Defining specific circumstances which would wipe out the risk cushion can aid in assessing the probability of such occurrences. In the above example, any one of the following departures from budgeted figures would eliminate the $7,503 risk reserve:

1. A drop of $2.01 per hundredweight in market hog prices,
2. An increase of 6.4% in feed use or cost,
3. An increase of $0.33 per bushel in corn price,
4. A decline of .5 pigs per litter, or
5. A decline of .2 pigs per litter *and* an increase of $0.10 per bushel *and* an increase of 2.0% in feed use.

Unless the budgeted price of market hogs was lowered to account for risk, the probability of a $2.01 lower price is rather high. Items 2, 3, and 4 might be judged "somewhat unlikely," but the combination of events in item 5, like the change in hog prices, appears more likely. Of course, any combination of two or more of these events could occur, each reducing cash available by $7,503 or more.

Assuming this is judged a relatively high risk situation, what would be the consequences of failure to meet cash flow needs? At the one extreme, the operator could be forced out of business and lose part or all of his net worth. This might be a situation in which hog production was the major or the only enterprise, where there was no cash or credit reserves, there were no assets that could be converted into cash, there was no other source of income in excess of living expenses, or the lender was unwilling to extend additional credit or revise existing credit terms.

At the other extreme, the consequences might be only a minor inconvenience for a farmer who had substantial cash or credit reserves, who had assets that could be converted to cash without severe adverse effects on the total farming operation, who had other income in excess of living expenses, or if the lender was willing to extend more credit or alter existing terms.

It should be emphasized that this cash flow analysis assumes, over the long run, the budget figures will prove correct. A similar analysis could be made in analyzing the return/cost budget to assess the risk involved if average estimates turn out wrong.

Summary

The return/cost budget is a useful tool in analyzing the profitability of an enterprise. When using such a budget, consideration should be given to sources of information, markets, price risk, startup expenses, management requirements, and the method of estimating interest costs. Some budgets are prepared on a "going concern" basis and may not include startup expenses, which can be substantial. A common procedure used to estimate interest costs is to assume an average investment of one-half of initial investment, which understates actual interest costs.

Cash available for debt repayment can be estimated from return/cost budgets by adding to the going concern profit estimates, noncash expense items such as depreciation, opportunity costs for equity capital, and family labor in excess of living needs. Cash available during the first year of production requires modification of cash inflows and outflows to account for startup expenses and reduced efficiency. The amount of capital (debt) should be increased by the accumulated interest during the time prior to the beginning of debt repayment if not already included in the budget.

Alternative payment plans can be examined to determine whether estimated cash available is sufficient to service the debt with a reserve for risk. Changes that would eliminate the risk reserve should be calculated as changes in production, prices, quantity marketed, factor costs, etc. This can aid in assessing the probability of such occurrences. Finally, consideration must be given to the consequences of failure to meet debt servicing needs.

References

Farm Management Manual. Cooperative Extension Service Publication AE-4473, University of Illinois (March, 1985): 22 pp.

Farm Planning and Financial Management. Cooperative Extension Service Publication ID-68, Purdue University (1980): 75 pp.

Herbst, J. H. *Farm Management Principles, Budgets, Plans, 5th Ed.* Stipes Publishing Co.: Champaign, Illinois, (1980).

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